Vol. iii. is similarly mainly bacteriological. Balfour Stewart shows the wide distribution of the *Bacillus enteritidis sporogenes* of Klein, MacConkey contributes a paper on the differentiation and isolation of the *Bacillus coli* and *Bacillus typhosus* from mixtures by means of media containing bile salts.

The printing, illustrations and general "get-up" of the volumes are excellent. There is, perhaps, a tendency to needless detail in some places, as, for example, in the list of milk samples, but many of the papers are contributions of real scientific value.

Einführung in die Stöchiometrie. Von Joachim Biehringer. Pp. xviii + 498. (Brunswick: F. Vieweg und Sohn, 1900.)

THIS book, which differs greatly from the ordinary text-books of chemistry, has for sub-title "A study of the quantitative composition of substances and the properties connected therewith." So far as subject-matter is concerned, it covers much the same ground as Part i. of Ostwald's *Allgemeine Chemie*, the general arrangement evidently being inspired by that work. The treatment, however, is radically different, theoretical matters, although adequately outlined, being made subservient to their practical applications, which are illustrated by a wealth of numerical examples. The arithmetical exercises are, in fact, the chief feature of the book. There are altogether three hundred of them, each of which is provided with a fully-worked solution, the method of calculation being carefully explained. The problems are well-selected, unpedantic, and of real value in their application to laboratory or technical work. Some are, perhaps, a little far-fetched, but even these are instructive, and almost always possess some human interest. For example: "It is desired to convert into sparkling wine 1000 litres of new wine containing 10 per cent. by volume of alcohol and 0·5 per cent. of unfermented sugar. How much cane-sugar must be added in order that after fermentation the wine may have a pressure of 5 atmospheres, the temperature of the cellar being 12°?" The student will be especially grateful for the numerous examples of the calculation of molecular weights, and of the results of analysis, both gravimetric and volumetric. Altogether no better guide could be desired to chemical and elementary physico-chemical calculations.

Travail des Metaux dérivés du Fer. Par L. Gages, Capitaine d'Artillerie. "Encyclopédie Scientifique des Aide-Memoire." Pp. 202; 40 illustrations. (Paris: Gauthier-Villars, 1900.) Price 2 fr. 50 centimes.

THIS new member of the excellent *aide-memoire* series worthily upholds the reputation built up by its predecessors. It gives in clear, terse language a short summary of the mechanical and thermal treatment to which steel is subjected to prepare it for use in the industries, and the greater part of the remainder of the book is given up to considerations of the theory of hardening and tempering. The solution theory of the constitution of steel is so firmly established in France that it is now taken as an authoritative explanation of the facts; but some of the thermal and micrographic evidence is given, on which the theory is based. In dealing with "steels" which owe their distinctive properties to the admixture with iron of elements other than carbon, Captain Gages makes a new departure in classifying them in accordance with a law enunciated by Sir William Roberts-Austen, which sets forth the fact that elements having a lower atomic volume than iron tend to harden steel, and those with a higher atomic volume to soften it and make it malleable. This classification of a large class of materials which are comparatively new to engineers seems useful and businesslike, and, indeed, Captain Gages, by bringing into a brief and readable form the results of the labours of Osmond, Werth and many others, has done much to popularise the whole subject.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

The Stability of a Swarm of Meteorites.

REFERRING to my paper in NATURE of October 11, "On the Stability of a Swarm of Meteorites, &c.," Mr. R. B. Hayward, F.R.S., has called my attention to the fact that the supposition, made near the foot of the first column, that

$$\xi = a\cos\omega t,\ \eta = b\sin\omega t,$$

in other words that the relative orbit of the particle under consideration is an ellipse of semi-axes a, b, involves an eccentricity,

$$\sqrt{1 - b^2/a^2},$$

for that ellipse of amount

$$n\sqrt{3/(\mu - \omega^2)} = \sqrt{6n/(\sqrt{n^2 + 16\mu} - n)},$$

so that in strictness the relative orbit cannot be a circle unless $n = 0$.

This point ought, perhaps, to have been brought out in my paper as illustrating the rudeness of the approximation of the shape of the swarm to a sphere in any actual case, a matter which I touched on in speaking of the inutility of further refinements, such as the effect of the ellipticity of the swarm's orbit round the sun. However, for any probable swarm in the solar system, n^2/μ must be a very small fraction, and so ω^2 may be very nearly equal to μ (if the centre of the swarm is fixed, $\mu = \omega^2$), while b/a is nearly unity.

Mr. Hayward suggests that the same difficulty may have been felt by others, and that therefore the above explanation may be desirable. ANDREW GRAY.

The University, Glasgow, December 29, 1900.

An Artificial Representation of a Total Solar Eclipse.

IN preparing for polarisation experiments on the solar corona, it is extremely desirable to have an artificial corona as nearly as possible resembling the reality for preliminary work. The only device of the kind that has been used to my knowledge was the arrangement described by Wright in his eclipse report, consisting of a cardboard funnel, lined with black cloth, with a light at the back. This gives a ring-shaped illuminated area radially polarised. It is believed that the contrivance about to be described will be found far better adapted to work of this sort, for the artificial corona in this case resembles the real so closely as to startle one who has actually witnessed a total solar eclipse. The polarisation is radial, and is produced in the same way as in the sun's surroundings, and the misty gradations of brilliancy are present as well. So perfect was the representation that I added several features of purely æsthetic nature to heighten the effect, and finally succeeded in getting a reproduction of a solar eclipse which could hardly be distinguished from the reality, except that the polar streamers are straight, as drawn by Trouvelot, instead of being curved, as all the recent photographs show them. The curious greenish-blue colour of the sky, and the peculiar pearly lustre and misty appearance are faithfully reproduced. For lecture purposes an artificial eclipse of this sort would be admirably adapted, and I know of no other way in which an audience could be given so vivid an idea of the beauty of the phenomenon. Drawings and photographs are wholly inadequate in giving any notion of the actual appearance of the sun's surroundings, and I feel sure that any one will feel amply repaid for the small amount of trouble necessary in fitting up the arrangement which I shall describe.

A rectangular glass tank about a foot square on the front and five or six inches wide, and a six candle-power incandescent lamp are all that are necessary. The dimensions of the tank are not of much importance, a small aquarium being admirably adapted to the purpose. The tank should be nearly filled with clean water, and a spoonful or two of an alcoholic solution of mastic added. The mastic is at once thrown down as an exceedingly fine precipitate, giving the water a milky appearance. The wires leading to the lamp should be passed through a short glass tube, and the lamp fastened to the end of the tube with sealing wax, taking care to make a tight joint to prevent

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the water from entering the tube (Fig. 1). Five or six strips of tinfoil are now fastened with shellac along the sides of the lamp, leaving a space of from ½ to 1 mm. between them. The strips should be of about the same width as the clear spaces. They are to be mounted in two groups on opposite sides of the lamp, and the rays passing between them produce the polar streamers. The proper number, width and distribution of the strips necessary to produce the most realistic effect can be easily determined by experiment. A circular disc of metal a trifle larger than the lamp should be fastened to the tip of the lamp with sealing-wax, or any soft, water-resisting cement; this cuts off the direct light of the lamp and represents the dark disc of the moon. The whole is to be immersed in the tank, with the lamp in a horizontal position and the metal disc close against the front glass plate (Fig. 2). It is a good plan to have a rheostat in circuit with the lamp to regulate the intensity of the illumination. On turning on the current and seating ourselves in front of the tank, we shall see a most beautiful corona, caused by the scattering of the light of the lamp by the small particles of mastic suspended in the water. If we look at it through a Nicol prism we shall find that it is radially polarised, a dark area appearing on each side of the lamp, which turns as we turn the Nicol. The illumination is not uniform around the lamp, owing to unsymmetrical distribution of the candle-power, and this heightens the effect. If the polar streamers are found to be too sharply defined or too wide, the defect can be easily remedied by altering the tinfoil strips. The eclipse is not yet perfect, however, the illumination of the sky background being too white and too brilliant in comparison. By adding a solution of some bluish-green aniline dye (I used malachite-green), the sky can be given its weird colour and the corona brought out much more distinctly. If the proper amount of the dye be added, the sky can be strongly coloured without apparently changing the colour of the corona in the slightest degree, a rather surprising circumstance, since both are produced by the same means.

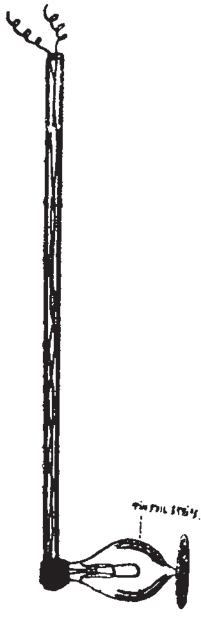

FIG. 1.

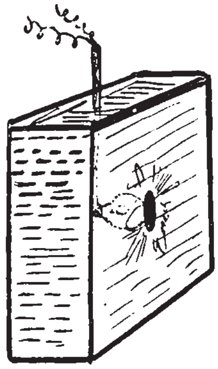

FIG. 2.

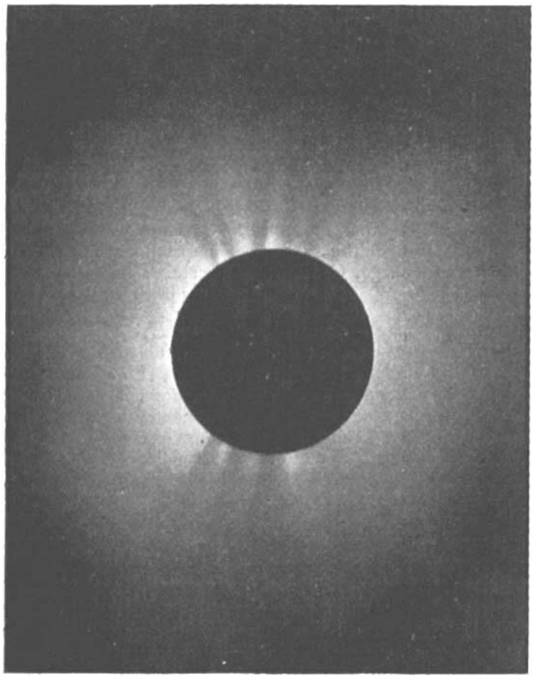

FIG. 3.

We should have now a most beautiful and perfect reproduction of the wonderful atmosphere around the sun, a corona of pure golden white light, with pearly lustre and exquisite texture, the misty streamers stretching out until lost on the bluish-green background of the sky. The rifts or darker areas due to the unequal illumination are present as well as the polar streamers. The effect is heightened if the eyes are partially closed.

A photograph of one of these artificial eclipses is reproduced in Fig. 3. Much of the fine detail present in the negative is lost in the print, and still more will doubtless go in the process of reproduction. No especial pains were taken to get the polar streamers just right. R. W. WOOD.

University of Wisconsin.

Sexual Dimorphism.

I CRAVE your leave to reply to one part of the careful and considerate criticism with which Prof. Meldola has honoured my book on "Sexual Dimorphism." He declares his inability to see any force in one of the crucial arguments of my theory, namely, that concerning unisexual inheritance, or, in Darwin's phraseology, heredity as limited by sex. He asks, Why should characters mechanically impressed upon the male during a particular period of his life be hereditary, and characters arising by spontaneous variation at that period not be hereditary? But this is not the question we have to consider. The question discussed in my argument is, Why should characters arising by spontaneous variation at any period of life in one sex be inherited by offspring of the same sex, and not by offspring of the opposite sex?

Prof. Meldola maintains that *on either hypothesis* all characters must originate in an individual which must be either male or female, and asks why there should ever be any blending of characters at all. He appears, therefore, to suppose that all spontaneous variations are inherited only by offspring of the same sex as the parents in which they occurred. It is well known that this is not the case. Many instances are on record in which additional fingers have occurred in a man, and have been inherited by both male and female descendants. I have myself much experience in breeding mice, and in them, although the colours of the parents do not blend perfectly or always in the offspring, yet the colour of the male parent is not more often inherited by male progeny than by female. On the other hand, blending often occurs, and if a male pouter pigeon is matched with a female fantail, the male progeny are not perfect pouters, nor the female perfect fantails.

Darwin has discussed the question in a well-known passage ("Descent of Man," 2nd edit. p. 231): "If a breeder observed that some of his pigeons varied into pale blue, could he, by long continued selection, make a breed in which the males alone should be of this tint, whilst the females remained unchanged? I will here only say that this, though perhaps not impossible, would be extremely difficult; for the natural result of breeding from the pale blue males would be to change the whole stock of both sexes to this tint. If, however, variations of the desired

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